

We claim:

- 1 1. A method of coordinating access to a data network service comprising:
  - 2 maintaining a registry of a plurality of service providers;
  - 3 receiving a query for a requested data network service from a source, said
  - 4 query including required attributes of said requested data network service;
  - 5 searching said registry to determine whether a given one of said plurality of
  - 6 service providers in said registry can provide said requested data network
  - 7 service having said required attributes; and
  - 8 if said given one of said plurality of service providers in said registry can
  - 9 provide said requested data network service having said required attributes,
  - 10 sending information identifying said given one of said plurality of service
  - 11 providers to said source of said query.
- 12 2. The method of claim 1 further comprising, if none of said plurality of service
- 13 providers in said registry can provide said requested data network service having
- 14 said required attributes,
  - 15 selecting a remote directory service utility; and
  - 16 sending a propagated query to said remote directory service utility.
- 17 3. The method of claim 2 wherein said selecting comprises consulting a summary of
- 18 services available at said remote directory service utility to determine that said
- 19 requested data network service is likely to be available from a service provider
- 20 registered with said remote directory service utility.
- 21 4. The method of claim 2 wherein said selecting is based on a hierarchical
- 22 relationship and said remote directory service utility is hierarchically higher than a
- 23 directory service utility performing said selecting.
- 24 5. The method of claim 1 wherein said query is described using Extensible Markup
- 25 Language (XML).

6. The method of claim 1 wherein said source of said query is a network connected device requiring said data network service.

7. The method of claim 1 wherein said source of said query is a directory service utility.

8. The method of claim 1 further comprising:

receiving, from a particular service provider, a service description indicating attributes of a provided service; and

adding said particular service provider to said registry.

9. A directory service utility comprising:

a registry of a plurality of service providers;

a processor for searching said registry to determine whether a given one of said plurality of service providers in said registry can provide a requested data network service having required attributes; and

a network interface for:

receiving a query for said data network service having said required attributes from a source; and

sending information identifying said given one of said plurality of service providers to said source of said query.

10. A directory service utility comprising:

means for maintaining a registry of a plurality of service providers;

means for receiving a query for a requested data network service from a source, said query including required attributes of said requested data network service;

means for searching said registry to determine whether a given one of said plurality of service providers in said registry can provide a requested data network service having required attributes; and

means for sending information identifying said given one of said plurality of service providers to said source of said query.

11. A computer readable medium containing computer-executable instructions which, when performed by a processor in a directory service utility, cause the processor to:

maintain a registry of a plurality of service providers;

receive a query for a requested data network service from a source, said query including required attributes of said requested data network service;

search said registry to determine whether a given one of said plurality of service providers in said registry can provide said requested data network service having said required attributes; and

if a given one of said plurality of service providers in said registry can provide a requested data network service having said required attributes, send information identifying said given one of said plurality of service providers to said source of said query.

12. At a first directory service utility situated in a local service cluster, a method of coordinating access to a data network service comprising:

maintaining a registry of a plurality of service providers;

receiving a propagated query for a requested data network service from a second directory service utility situated in a remote service cluster, where said propagated query includes a source of an initial query and required attributes of said requested data network service;

searching said registry to determine whether a given one of said plurality of service providers in said registry can provide said requested data network service having said required attributes; and

if said given one of said plurality of service providers in said registry can provide said requested data network service having said required attributes, extracting said source of said initial query from said propagated query; and sending information identifying said given service provider to said source of said initial query.

13.A method of registering a service provider comprising:

receiving a data network address for said service provider  
receiving, from said service provider, attributes of a service provided by said service provider, where said attributes are expressed in Extensible Markup Language format; and  
adding said service provider to a registry of service providers.

14. The method of claim 13 further comprising:

before said receiving, receiving, from said service provider, a multicast message requiring a directory service utility and indicating attributes of a provided service; and  
replying to said message.

15. At a service provider, a method of registering with a directory service utility comprising:

multicasting a message indicating a requirement for a directory service utility;  
receiving a reply from a given directory service utility; and  
sending a service description to said given directory service utility.

16. The method of claim 15 wherein said service description includes attributes of a service provided by said service provider.

1 17. The method of claim 16 wherein said attributes include a location of said service  
2 provider.

1 18. A method of building network relationships at a first directory service utility in  
2 communication with at least one other directory service utility, said method  
3 comprising:

4 selecting one said directory service utility from said at least one other  
5 directory service utility as a selected directory service utility;

6 assigning said selected directory service utility a parent directory service utility  
7 designation; and

8 indicating said parent directory service utility designation to said selected  
9 directory service utility.

1 19. A method of service information propagation at a first directory service utility  
2 comprising:

3 creating a summary of information about at least one service provider  
4 registered with said first directory service utility; and

5 sending said summary to a second directory service utility.

1 20. The method of claim 19 wherein said second directory service utility has been  
2 designated as a parent directory service utility of said first directory service utility.

1 21. The method of claim 19 wherein said creating said summary involves bloom  
2 filtering.

1 22. A method of coordinating access to a data network service comprising:

2 maintaining a registry of a plurality of service providers;

3 receiving a query for a requested data network service from a source, said  
4 query including required attributes of said requested data network service;

5 searching said registry to determine whether a given one of said plurality of  
6 service providers in said registry can provide said requested data network  
7 service having said required attributes; and

8 if none of said plurality of service providers in said registry can provide said  
9 requested data network service having said required attributes,

10 consulting a summary of services available at service providers registered  
11 with at least one remote directory service utility;

12 determining that said requested data network service is available from a  
13 service provider registered with a particular remote directory service utility;  
14 and

15 sending a propagated query to said particular remote directory service utility,  
16 where said propagated query is based on said query for said requested data  
17 network service.